Steering Gear and Linkage 13

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GENERAL DESCRIPTION

The steering gear fitted to Transit variants may be either standard or of a heavy duty design. This section covers both types of gear, related linkages and steering column assemblies.

Both steering boxes are of similar design and of the recirculating ball design, but the standard steering box has a worm and nut and the heavy duty a worm and peg drive. Correct steering 'feel' is achieved for both gears by a preloaded rocker shaft.

The steering shaft is integral with the steering box and supported by a column tube assembly. The column tube is clamped to the steering gear, and at its upper end by a bracket bolted through the pedal box and secured to the dash panel.

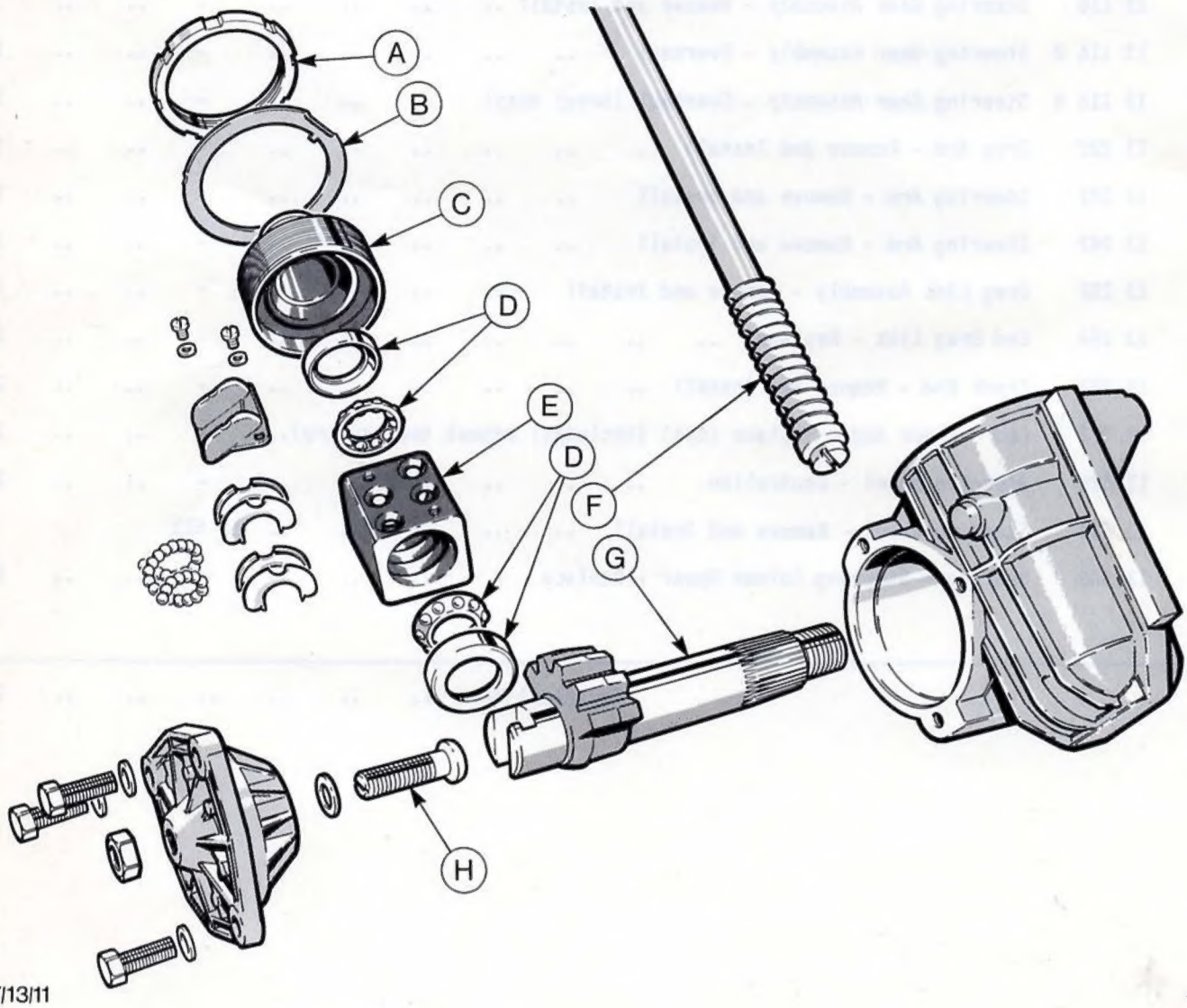

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Fig.1. Steering gear assembly (standard gear).

A - Adjusting screw locknut
B - Lock washer
C - Adjusting screw
D - Thrust bearings
E - Worm nut
F - Steering shaft worm
G - Rocker shaft
H - Rocker shaft adjusting screw

GENERAL DESCRIPTION (cont'd)

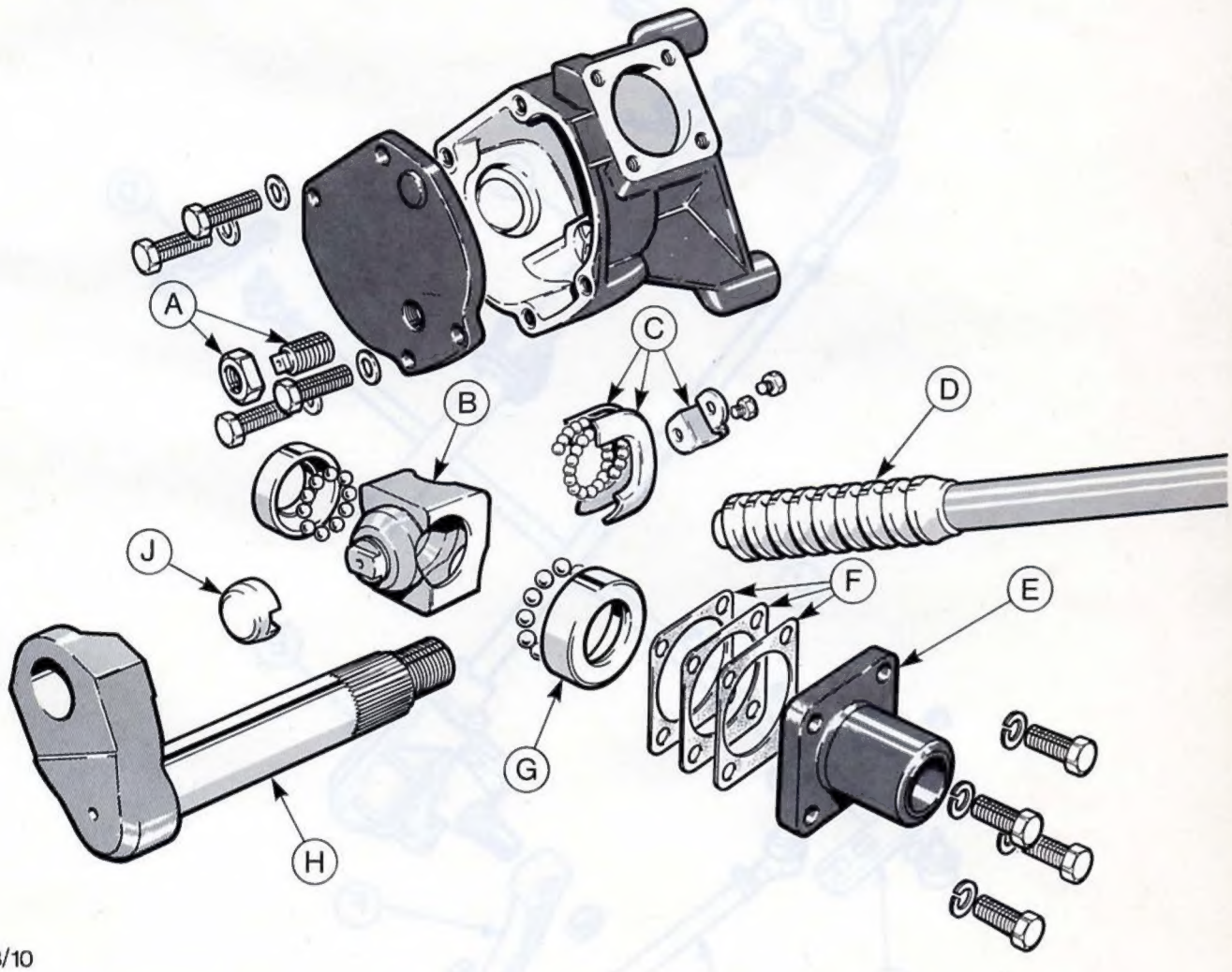

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Fig.2. Steering gear assembly, (heavy duty gear)

A - Adjusting screw and locknut
B - Worm nut
C - Transfer tube and steel balls
D - Steering shaft worm
E - Upper bearing pre-load cover plate
F - Selective pre-load shims
G - Upper bearing assembly
H - Rocker shaft
J - Sliding pivot

GENERAL DESCRIPTION (cont'd)

The steering linkage consists of an adjustable drag link connecting the steering box drop arm to the stub axle steering arm. An adjustable track rod, links both L.H. and R.H. steering arms. The steering arms are bolted to the stub axle spindle assembly.

Ball joints are handed left and right hand thread to permit adjustment of track and drag links without removal.

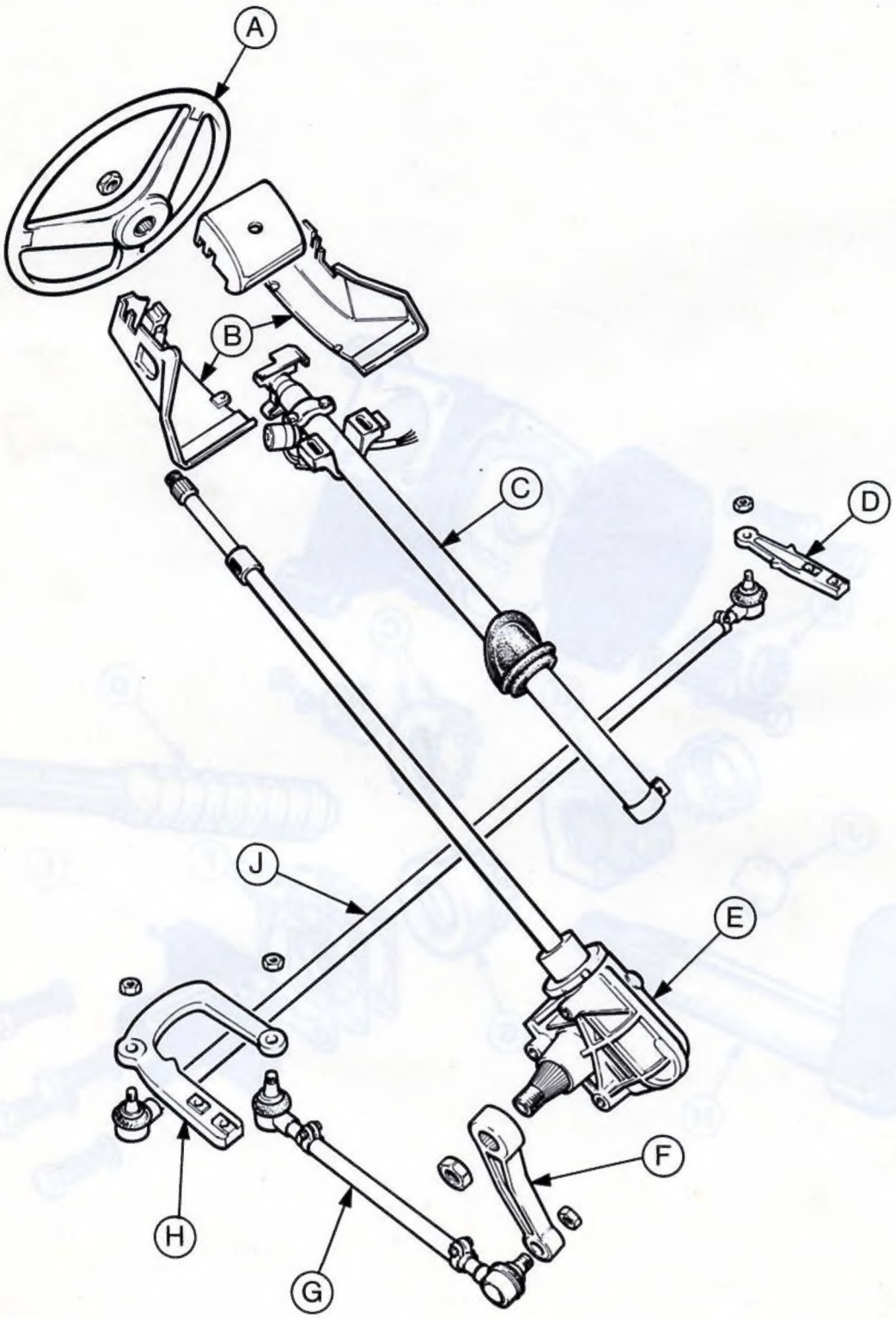

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Fig.3. Steering linkage and gear assembly.

A - Steering wheel
B - Steering column shrouds
C - Column tube
D - Non-drivers side steering arm.
E - Steering gear assembly.
F - Drop arm.
G - Drag link.
H - Drivers side steering arm.
J - Track rod

SERVICE ADJUSTMENTS AND CHECKS

At specified service intervals the following checks should be carried out:

- Rocker shaft pre load
- Check steering gear for leaks

When investigating complaints of noisy, stiff (heavy) or excessive movement of steering wheel the following should be checked before any adjustments to the steering box are made.

(i) check tyre pressures, and if necessary, adjust to specification. Check for uneven tyre wear.

(ii) check steering linkage ball joints for looseness, wear or seized condition

(iii) check king pin free play and movement. Ensure king pins are well lubricated

(iv) check security of drop arm to steering box rocker shaft

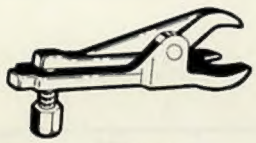
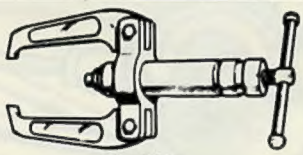
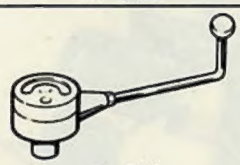
(v) check security of steering box to chassis member

(vi) incorrect steering column/gear alignment

(vii) noisy steering may be caused by steering column upper bush

(viii) Burman heavy duty steering box is correctly filled with specified oil

SPECIAL SERVICE TOOL RECOGNITION

Tool	Tool Name
13-002	Steering shaft bearing nut adjuster
 13-006	Ball joint separator
 14-008	Drop arm remover
 15-041	Pre-load gauge

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13 114 STEERING ROCKER SHAFT PRELOAD - ADJUST

NOTE: This procedure detailed below is for the standard steering gear. The Burman heavy duty adjustment procedure is detailed in operation 13 116 8.

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator	13-006
Preload gauge	15-041

1. Position road wheels in straight ahead position and maintain for duration of adjustment.

2. Jack up front of vehicle and fit axle stands.

3. Remove split pin and castellated nut, using Service Tool 13 006, disconnect drag link from drop arm.

4. Note total number of steering wheel turns for full travel of steering gear. Establish steering gear centre travel, the approximate position can be achieved by halving the total number of steering wheel rotations.

NOTE: Centre of steering gear travel is when 'high spot feel', and steering column shaft alignment mark is at 12 o'clock.

5. Position the steering wheel one turn anti-clockwise from this central position.

6. Slacken adjusting screw locknut.

7. Remove steering wheel emblem. Using special service gauge 15 041 and suitable socket measure torque required to rotate steering column shaft clockwise two complete revolution from the position set in sub-operation 5. Turn adjuster screw until 1,6 to 2,2 Nm is measured for gears with six turns or 2,5 to 3,0 Nm. on gears with seven turns (as previously established in sub - operation 4).

8. Hold screw and tighten adjuster locknut. See Technical Data. Re-check steering column shaft turning torque.

9. Reconnect drag link to drop arm and torque nut to specified torque. Fit new split pin.

10. Refit steering wheel centre emblem.

11. Remove axle stands and lower vehicle to ground.

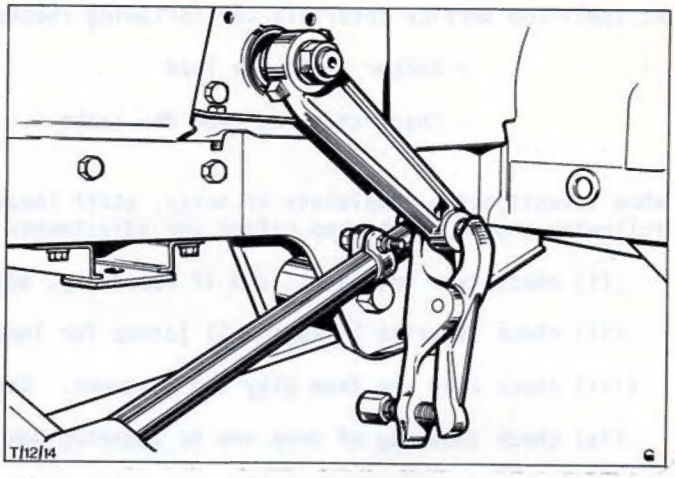

Fig.4. Disconnect drag link from drop arm using Service tool 13 006.

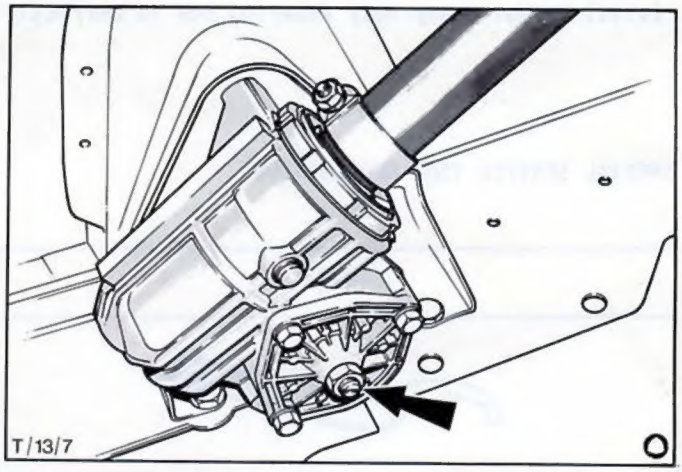

Fig.5. Rocker shaft adjusting screw and locknut.

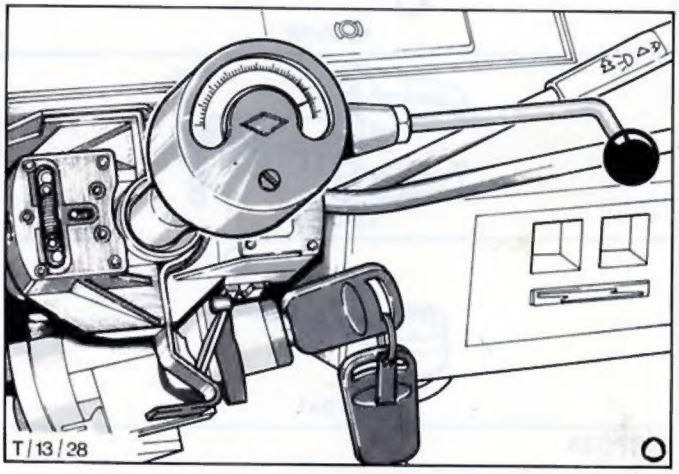

Fig.6. Measure torque required to rotate steering column shaft.

13 116 STEERING GEAR ASSEMBLY - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator	13-006
Puller	14-008

To Remove

1. Carefully prise off steering wheel centre emblem. Remove steering wheel locknut, remove steering wheel.
2. Remove cross head screw and detach column upper shrouds.
3. Remove cross head screws, detach two halves of the steering column lower shrouds.
4. Detach multi function switches and bracket from column. Disconnect loom connection from steering ignition lock.
5. Remove two nuts and plain washers from steering column top mounting.
6. From engine compartment loosen clamp bolt at lower end of steering column tube.
7. Disconnect drop arm nut and washer from steering gear rocker arm, using service tool 14 008 puller, pull off drop arm.
8. Remove steering gear to chassis retaining bolts. Fig.9.
9. Withdraw steering column tube upwards and remove from dash panel location.
10. Remove steering gear from vehicle, withdraw complete with steering shaft out through lower front of vehicle.

NOTE: On DIESEL variants it is necessary to remove the cooling system bypass tube from radiator bottom hose and water pump hose to achieve access. Position drain tray beneath engine to collect coolant. Loosen two hose clips and clamp bolt retaining bypass tube bracket, swing hose away from vehicle.

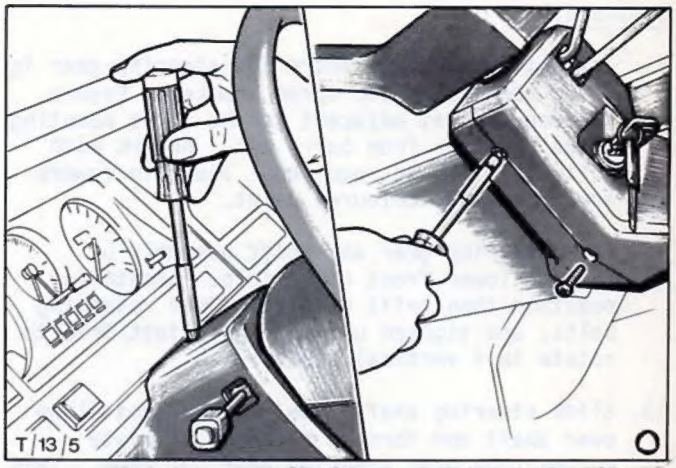

Fig.7. Remove crosshead screws securing column shrouds.

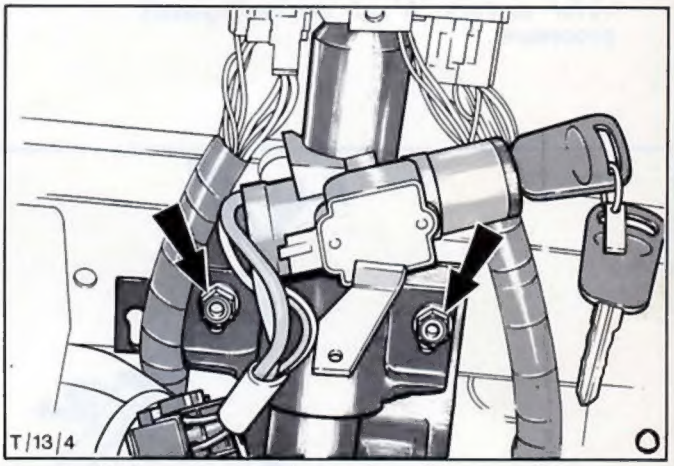

Fig.8. Remove upper steering column mounting nuts and plain washers.

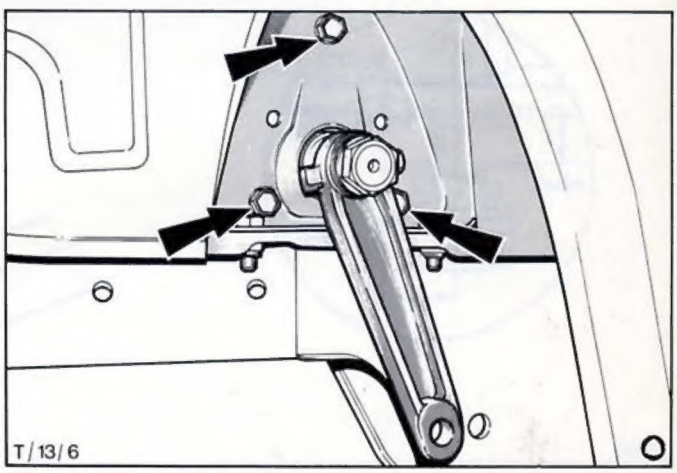

Fig.9. Remove steering gear to chassis lower mounting bolts.

13 116

To Install

11. Inspect the surface where the steering gear is to be mounted on the apron bracket. Ensure surface is flat adjacent to the three mounting holes and free from burrs etc. Rework with suitable files as required. Touch in rework area with body coloured paint.

12. Pass steering gear and shaft assembly up through lower front of vehicle. Locate in position then refit original three retaining bolts, and tighten until gear is just free to rotate in a vertical plane.

13. Slide steering shaft tube, grommet and clamp over shaft and through bulkhead. Locate column tube over steering gear 'O' ring. This should be possible without forcing the steering shaft downwards.

NOTE: If a foul condition exists between the steering shaft tube and the pedal box bracket, refer to Part 'A' of the realignment procedure.

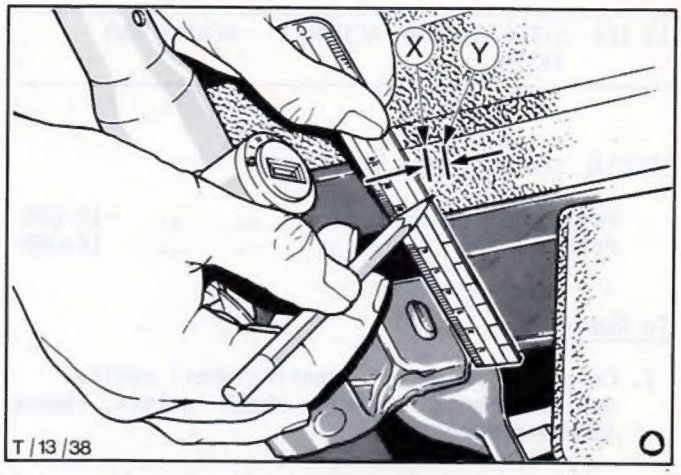

Fig.10. Measuring horizontal displacement 'X' and 'Y'.

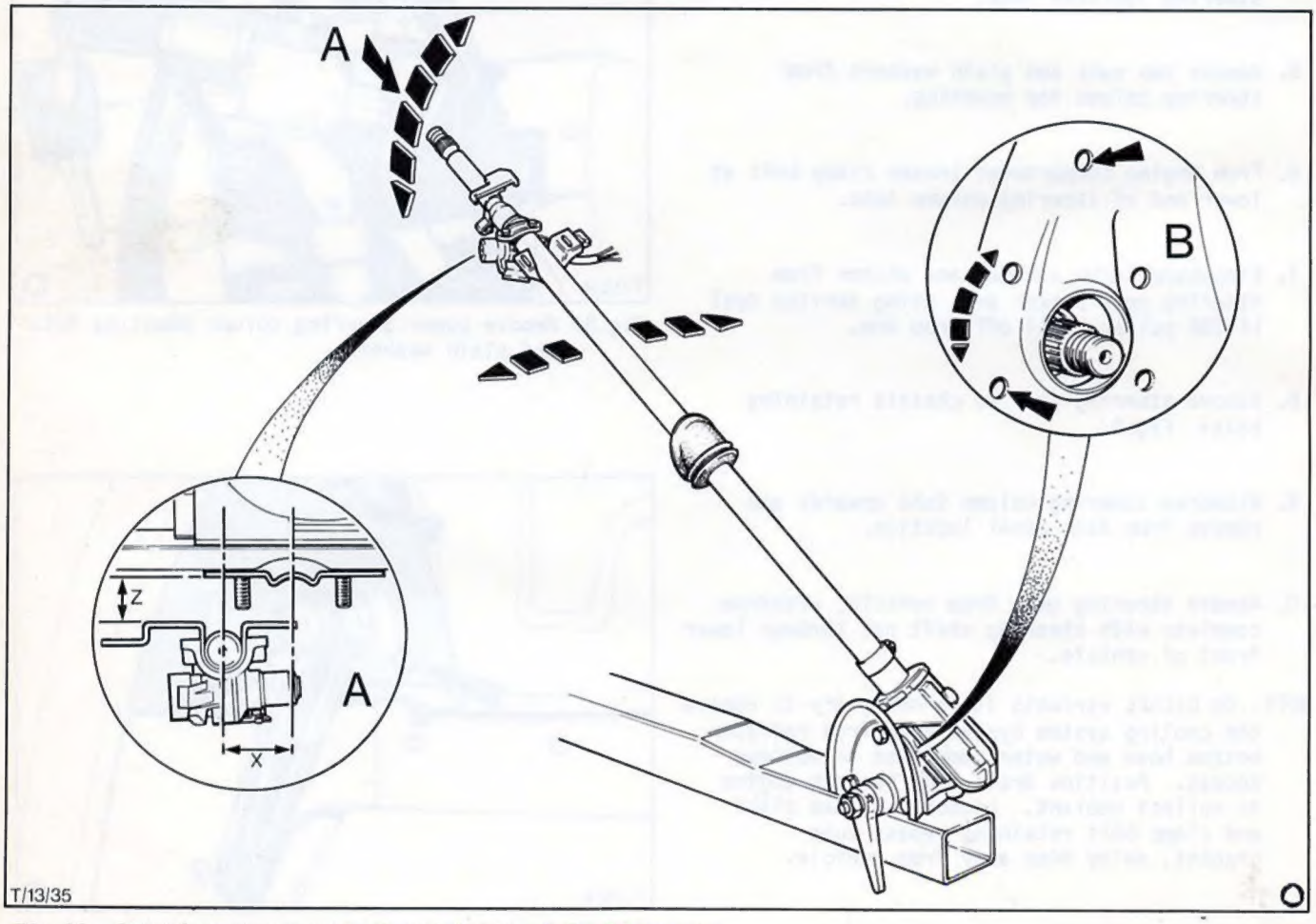

Fig.11. Steering gear vertical and horizontal alignments.
A) X = Horizontal displacement
Z = Vertical alignment
B = Rework steering gear mounting to adjust vertical alignment

14. Secure clamp bolt at lower end of steering column tube and tighten to 20-25 Nm (15 - 18 lbf.ft).

15. Fit two nuts and plain washers to upper steering column fixing (see note below) and tighten the nuts until a 5,0 mm (0,20 in) clearance exists between tube bracket and pedal box bracket.

NOTE: This should be possible without the steering shaft tube fouling the pedal box bracket. If a foul condition exists refer to Part 'A' and 'C' of the realignment procedure detailed on Page 11.

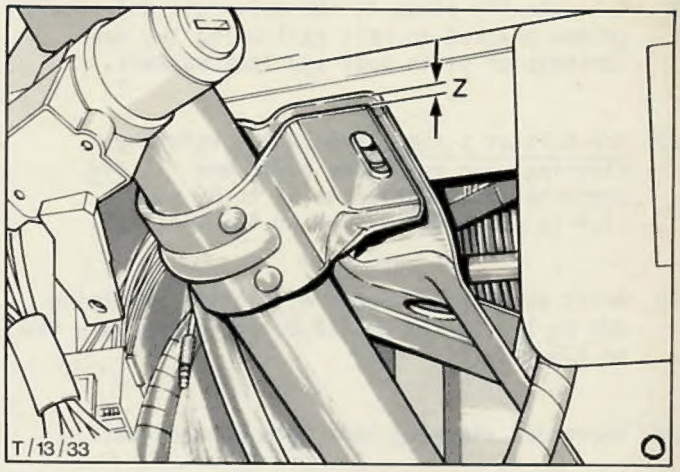

Fig.12. Adjust steering column until a gap of 5mm (Z) exists between bracket and pedal box bracket.

16. Tighten the three steering gear retaining bolts to 54 - 65 Nm (40 - 48 lbf.ft).

17. Mark horizontal position of the steering shaft tube bracket relative to the belt rail, see 'X', Fig.10.

18. Remove the two nuts/washers fitted in operation fifteen (15) and push the two studs up through the belt rail so that the steering column is free to adopt its natural position.

19. Measure the distance between the pedal box bracket and the steering shaft tube dimension 'Z'. in Fig.12.

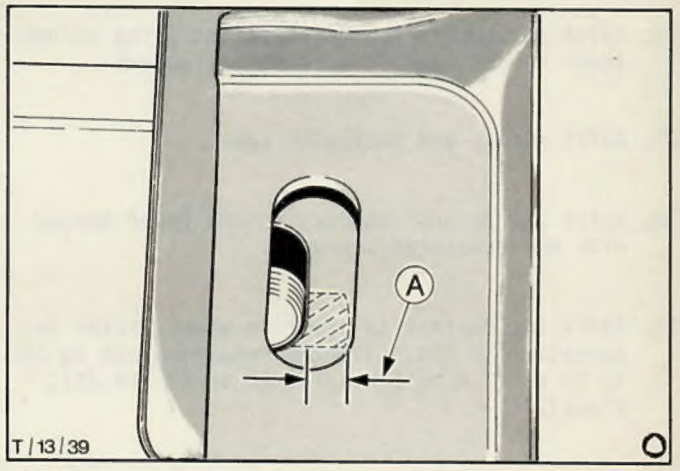

Fig.13. Mark horizontal displacement position of steering shaft. Rework belt rail to a maximum of 4 mm.

20. Mark the new horizontal position of the steering shaft tube relative to the belt rail, 'Y' in Fig.10. Note the difference between positions 'X' and 'Y'.

NOTE: If the dimension 'Z' is less than 9 mm, it is possible that the steering shaft tube may foul on the pedal box bracket preventing it from adopting its free horizontal position. Should this occur, it will be necessary to slacken the three steering gear retaining bolts to allow the steering column to drop clear of the pedal box bracket. Retorque the three steering gear retaining bolts in order to obtain the correct position for 'Y'. If this does not give sufficient vertical clearance refer to operation 'A' on page 11.

- The horizontal and vertical dimensions obtained in operations 19 and 20 should be between 0 and 8 mm.
- If either exceeds 8 mm refer to the realignment procedure detailed on page 11 before continuing reassembly.

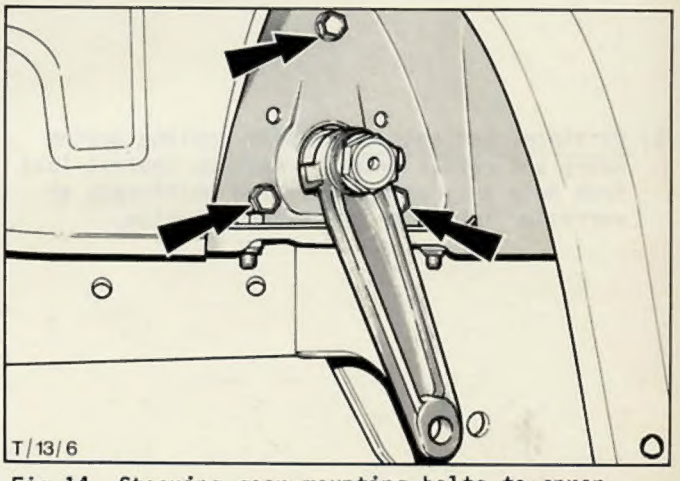

Fig.14. Steering gear mounting bolts to apron bracket.

21. Relocate the studs in the belt rail and secure column bracket to belt rail using two new locknuts or plain nuts and lock washers.

22. One bolt at a time, remove the existing steering gear retaining bolts and fit new patch bolts. Tighten to 54 to 65 mm (5,4 to 6,5 kgf.m - 40,0 to 48,0 lbf.ft).

23. Refit and secure drop arm, tighten retaining nut to 152 to 180 Nm (15,2 to 18,0 kgf.m - 110 to 130 lbf.ft).

24. Reconnect steering lock loom connection.

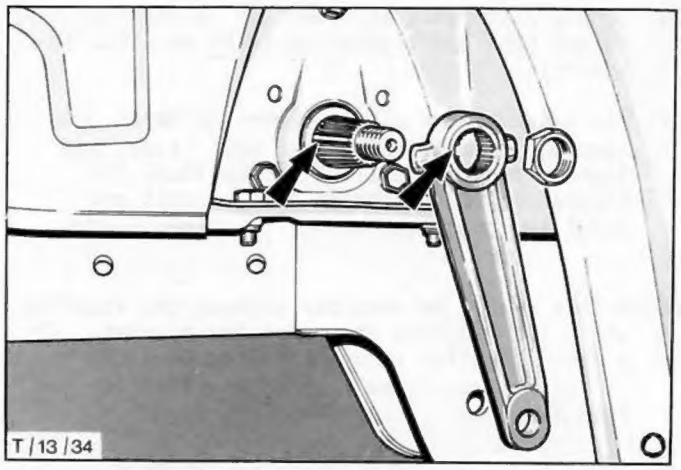

Fig.15. Refit drop arm locating master spline.

25. Refit multi switches and bracket to steering column and secure with two screws, Fig.16.

26. Refit and secure two halves of steering column lower shroud using two crosshead screws.

27. Refit spring and indicator cam.

28. Refit and secure steering column upper shroud with one crosshead screw.

29. Refit and centralise steering wheel, refer to operation 13 523. Tighten retaining nut to 28 to 34 Nm (2,8 to 3,4 kgf.m 20 to 25 lbf.ft), Fig.17.

30. Refit steering wheel centre emblem.

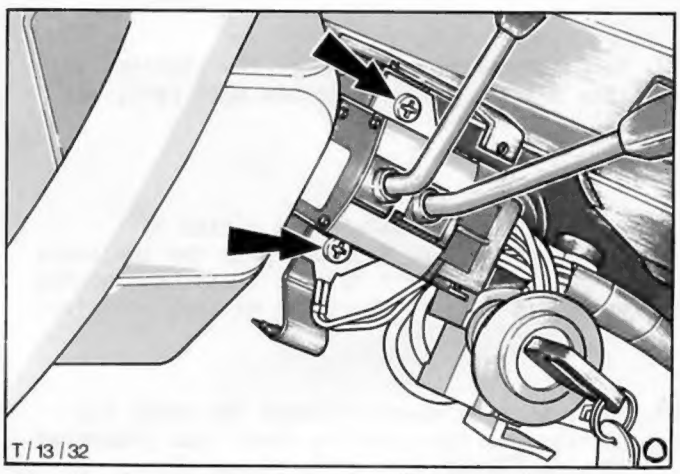

Fig.16. Reconnect multi- function switches to steering column.

31. On diesel variants only refit cooling system hoses and refill system. Replace coolant loss from drip tray using specified antifreeze or corrosion inhibitor and water solution.

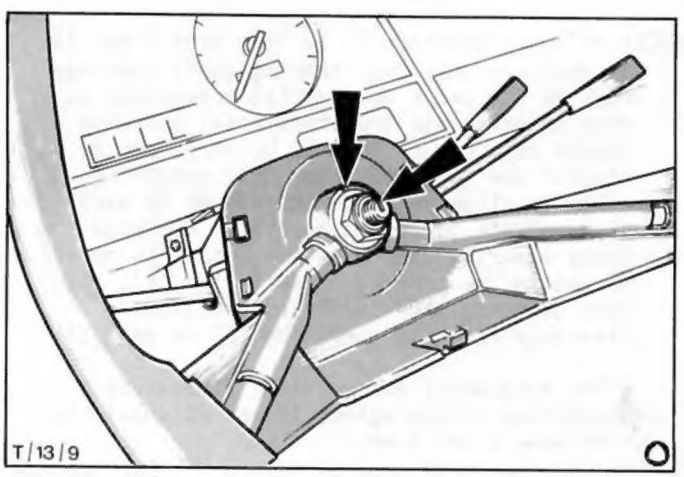

Fig.17. Align steering wheel to steering shaft.

Realignment Procedure

If during the steering gear installation difficulty is experienced in installing the steering shaft tube (Operation 13 and/or 15) or either of the dimensions obtained in Operations 19 or 20 are in excess of 8 mm the following procedure should be employed to correct these conditions.

The realignment procedure is broken down into three sections as follows:

A - STEERING SHAFT TOO HIGH

Steering column tube fouls pedal box bracket/belt rail during assembly.

Rework apron bracket by drilling the two holes 'B' and 'C' to 12 mm to permit gear and shaft assembly to rotate about hole 'A' and allow clearance condition at pedal box bracket, Fig.18.

NOTE: Ensure holes are free from burrs since this will affect horizontal positioning. Touch in reworked area with body coloured paint.

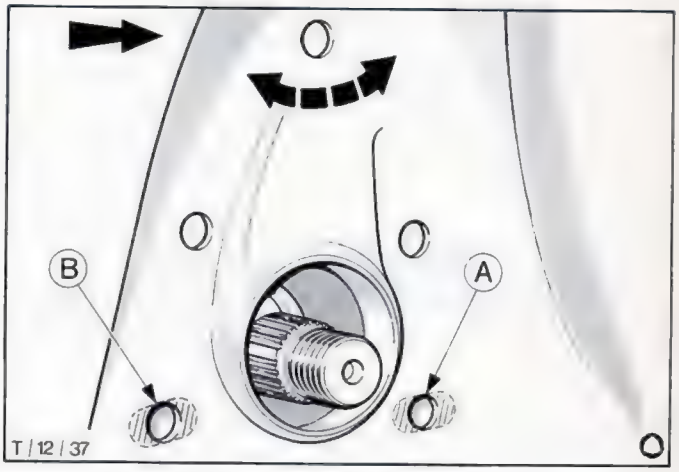

Fig.18. Rework apron bracket by drilling holes 'A' and 'B' to 12 mm.

B - STEERING SHAFT TOO LOW

In excess of 8 mm between pedal box bracket and steering shaft tube

Alignment 8 mm to 14 mm too low

This can be overcome by positioning a maximum of three 2 mm thick washers to each stud, between the pedal box bracket and the steering shaft tube bracket, e.g. if alignment measures 10 mm then fit one washer to each stud. Fig.19.

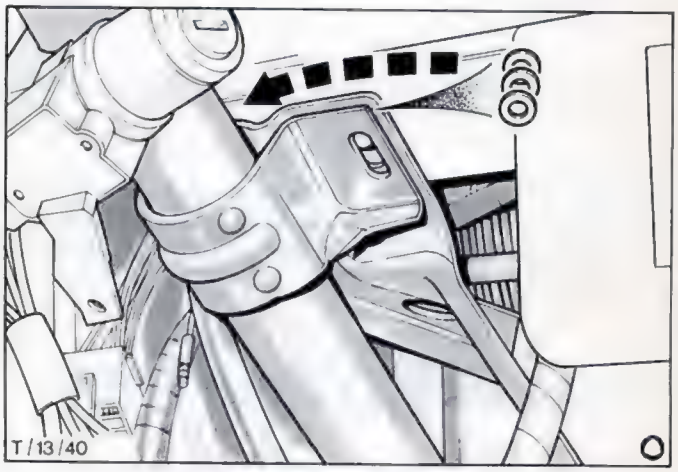

Fig.19. Insert 2 mm thick washers between steering shaft and column brackets.

Alignment 14 mm to 24 mm too low

Carry out operations detailed in 'A' and use three packing washers per stud

C - STEERING SHAFT DISPLACED HORIZONTALLY

In excess of 8 mm between the steering shaft and the pedal box bracket

If the horizontal displacement is between 8 and 12 mm. File slots in the belt rail/pedal box bracket location to a maximum of 4 mm, as shown in Fig.20.

If the horizontal displacement is 12 to 16 mm file out as described in the operation above and loosen the nuts securing the pedal box to the bulkhead.

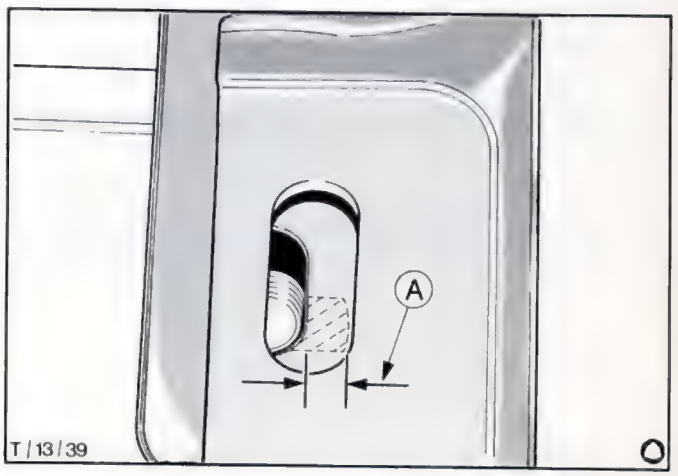

Fig.20. File slots in belt rail and pedal box to compensate for horizontal displacement.
A - Maximum of 4 mm

NOTE: It is not necessary to remove the servo/master cylinder for access to these nuts.
Tighten the steering shaft tube bracket to belt rail nuts and apply pressure to the pedal box in the required direction to improve alignment. Resecure the pedal box to bulkhead.

13 116 8 STEERING GEAR ASSEMBLY - OVERHAUL

SPECIAL SERVICE TOOLS REQUIRED

'C' Spanner	.. 13 002
Torque gauge	.. 15 041

NOTE: The procedure detailed below is for the standard steering gear. For overhaul procedure of the Burman Heavy duty refer to page 14.

To Dismantle

1. Remove rocker shaft adjusting screw locknut.
2. Remove bolts securing rocker shaft cover to housing, remove cover and rocker shaft assembly.
3. Screw in adjusting screw and separate rocker shaft and cover, Fig.21.
4. Bend back lock tang and slacken off steering shaft adjusting screw locknut using Special Service Tool 13 002. Remove adjusting screw and lock tab, Fig.22.
5. Unscrew thrust bearing adjuster and withdraw steering shaft and bearings from housing.
6. Remove clamp securing transfer tube to worm nut, remove transfer tubes and sixty-two steel balls, Fig.23.

NOTE: The worm shaft, nut and balls are matched sets and are not serviceable as individual items.

7. Prise out bearing cups from housing and upper bearing adjuster.
8. Thoroughly clean all components, inspect for wear and damage. Replace parts as necessary.

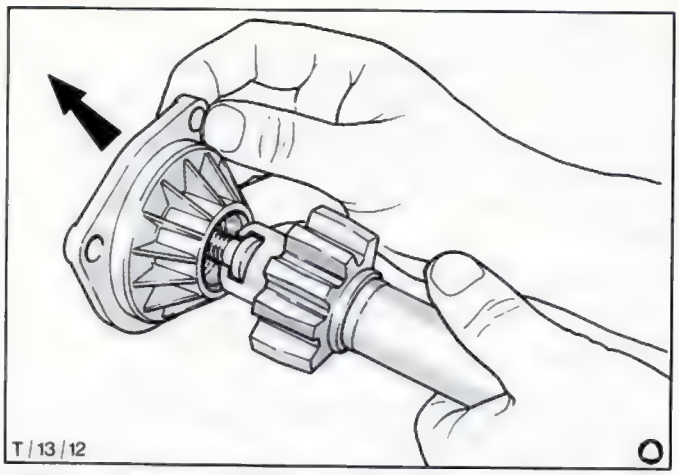

Fig.21. Separate rocker shaft from side cover and adjusting screw.

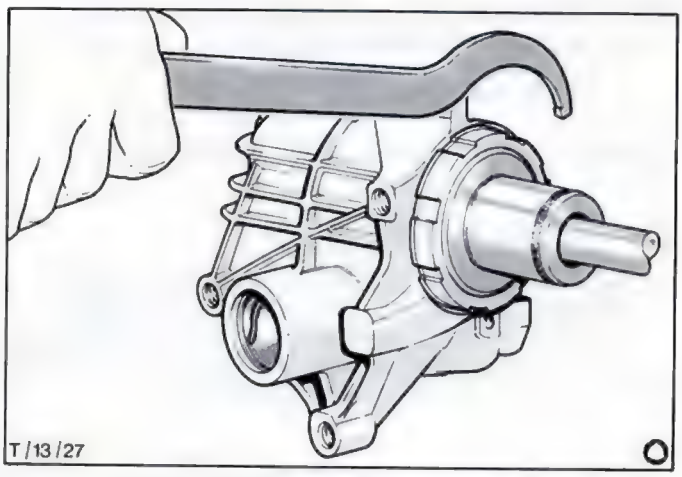

Fig.22. Remove thrust bearing adjuster, using service tool 13 002.

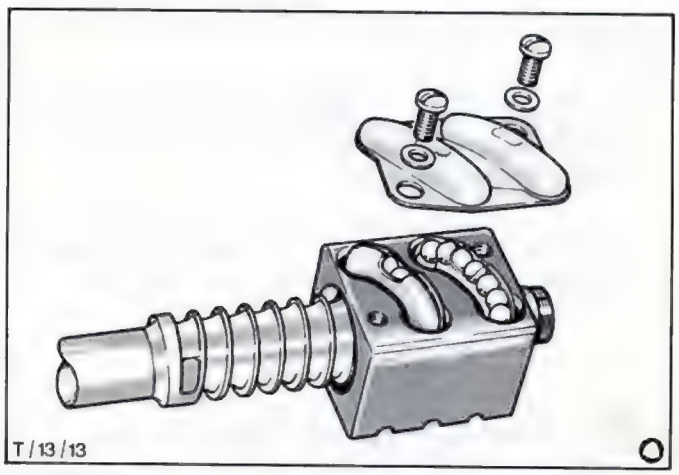

Fig.23. Remove transfer tube and sixty-two (62) steel balls.

To Assemble

9. Fit new bearing cups to housing and upper bearing adjuster, renew seal.

10. Slide worm nut over steering shaft, support worm nut and feed in the sixty-two steel balls. Refit transfer tubes and secure clamp.

NOTE: The steel balls are graded by a process which ensures all are of the same size and matched to the worm and nut.

11. Fit new bearing to worm shaft. Lubricate steering shaft assembly and worm bearings. with grease meeting Ford Specification, SLM-1C9110-A.

12. Fit new worm bearings into housing. Assemble nut and worm shaft assembly to housing.

13. Adjust upper bearing preload by screwing in steering shaft adjuster, screw in until a turning torque of 0,3 to 0,8 Nm (3,0 to 8 kgf cm - 0,3 to 1,7 lbf.in) is measured on preload gauge tool No. 15 041 Fig.25.

14. Holding steering shaft adjuster screw in position replace lock tab and lock nut, tighten to specified torque (see Technical Data).

15. Recheck turning torque of steering shaft, if correct, bend over lock tab.

16. Select adjusting screw shim to give a clearance between screw head and contact surface in rocker shaft 0,05 mm (0,002 in).

NOTE: Thickness of shims must be selected to ensure that adjusting screw can rotate freely.

17. Replace rocker shaft adjusting screw into cover.

18. Position rocker shaft side cover to rocker shaft, loosely fit locknut.

19. Fill steering gear with 2,2 Kg. of grease meeting Ford specification SLM-1C9110-A.

20. Fit new side cover gasket, slide rocker shaft assembly through housing, ensure correct tooth mesh. Secure rocker shaft side cover with three bolts and lock washers. Torque bolts to specification (see Technical Data). Fig.26.

21. Centralise steering shaft and adjust rocker shaft pre load as detailed in Operation 13 114 sub operation 7 and 8.

22. Tighten adjusting screw locknut.

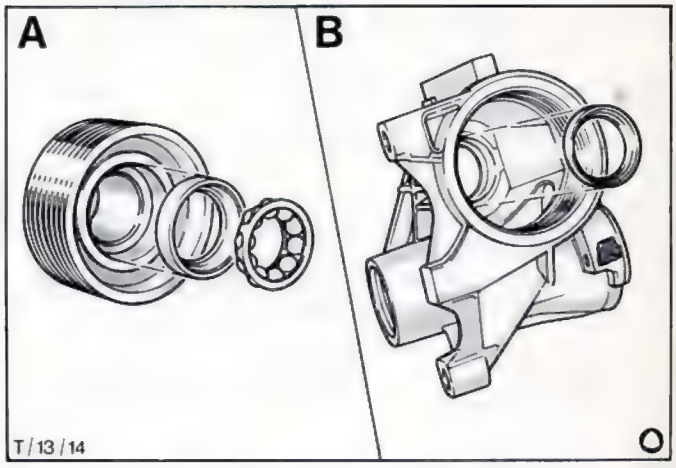

Fig.24. Assemble bearing cups into steering gear housing.
A - Locate upper bearing cup into adjuster
B - Locate lower bearing cup into steering gear housing

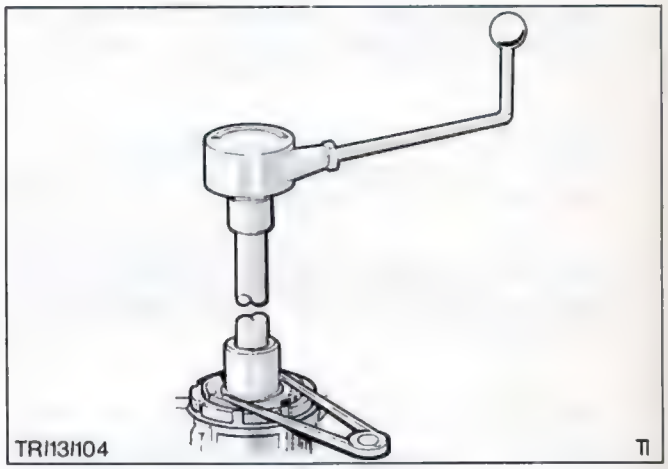

Fig.25. Check steering gear turning torque using Service tool 15 041.

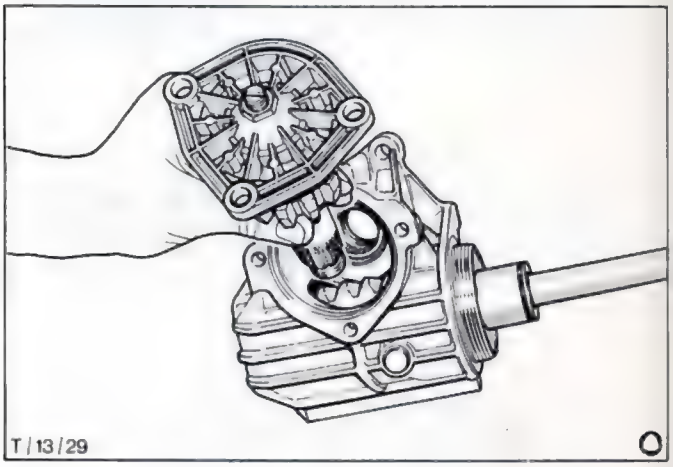

Fig.26. Assemble rocker shaft through housing ensure correct tooth mesh.

13 116 8 STEERING GEAR ASSEMBLY - OVERHAUL

SPECIAL SERVICE TOOLS REQUIRED: NONE

Heavy Duty Steering Gear only.

1. Drain steering box oil, remove bolts securing side cover to steering box, carefully remove cover and gasket. Remove adjusting stud and locknut from cover. Fig.27.

2. Slide rocker shaft out from housing, remove sliding pivot.

3. Remove upper bearing retainer bolts, remove retainer gasket and shims from shaft.

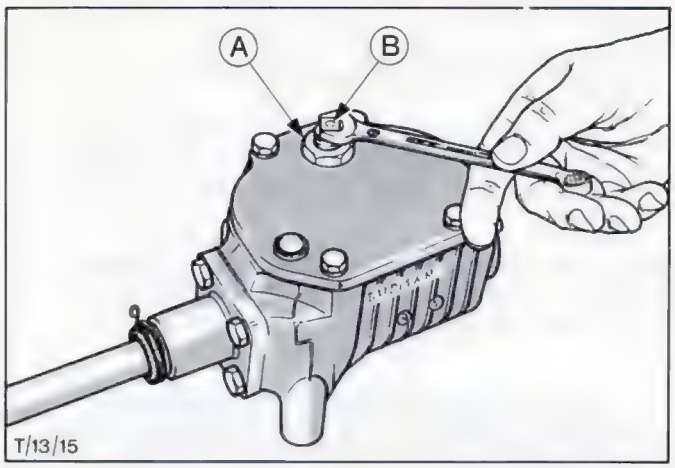

Fig.27. Remove adjusting stud and lock nut.
A - Adjusting screw locknut
B - Rocker shaft adjusting screw

4. Place steering gear over clean drain tray. Withdraw steering shaft until upper thrust bearing cup is clear of housing.

5. Remove upper bearing cup and thirteen (13) steel balls, also remove ten (10) steel balls from lower thrust bearing cup.

6. Remove steering shaft and nut assembly through side aperture of housing, remove lower thrust bearing cup.

7. Clamp steering shaft in vice using soft jawed vice, remove clamp from transfer tube, remove both halves of tube. Remove twenty seven (27) balls Fig.28.

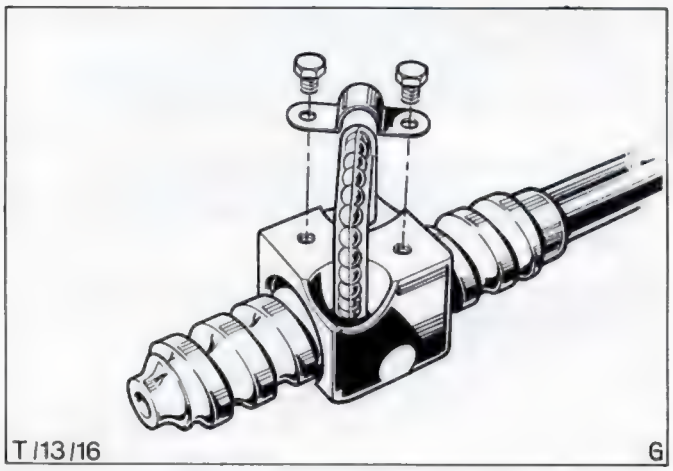

Fig.28. Remove transfer tube and steel balls.

NOTE: Care should be taken not to lose any of the steel balls. The twenty seven (27) balls are graded by a process which ensures all are of the same size, and matched to the worm and nut assembly.

8. Remove and discard the 'O' ring and seal from behind the retainer. Inspect rocker shaft bush and if unserviceable carry out sub operations 9 and 10.

9. Carefully remove the staking from end of rocker shaft bore using suitable chisel, discard retainer.

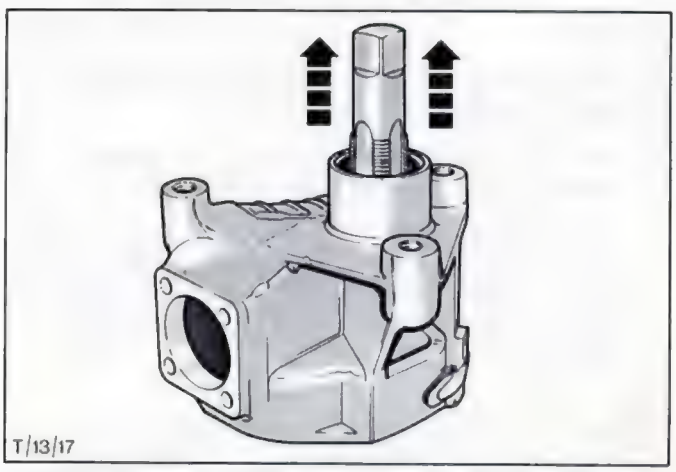

Fig.29. Remove rocker shaft bush using 7/8 BSP tap.

10. Remove rocker shaft bush by screwing a 7/8 B.S.P. tap into shaft bush and pressing out tap and bush from housing. Fig.29.

11. Clean and inspect all parts, replacing any which are unserviceable.

NOTE: The ball bearings used in the worm nut are larger than those used in the upper and lower bearings. The rocker shaft is replaceable, but shaft worm and nut are only serviced as an assembly.

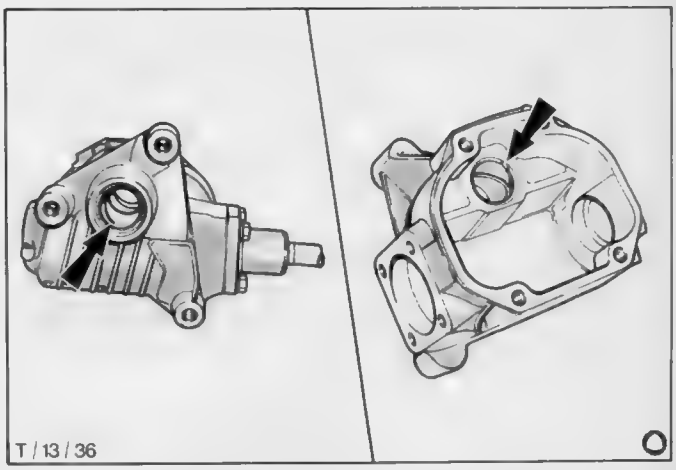

Fig.30. Ensure that open end of oil grove is open to the inside of the steering gear housing.

To Reassemble

12. If rocker shaft bush has been removed, press new bush into housing with open end of oil groove facing inside of housing.

13. Ream shaft bush to a diameter of 28,55 to 28,575 mm (1,124 to 1,125 in) clean all traces of swarf from steering housing Fig.30.

14. Fit new 'O' ring seal and retainer, stake outside of housing in four places to secure retainer, Fig.31.

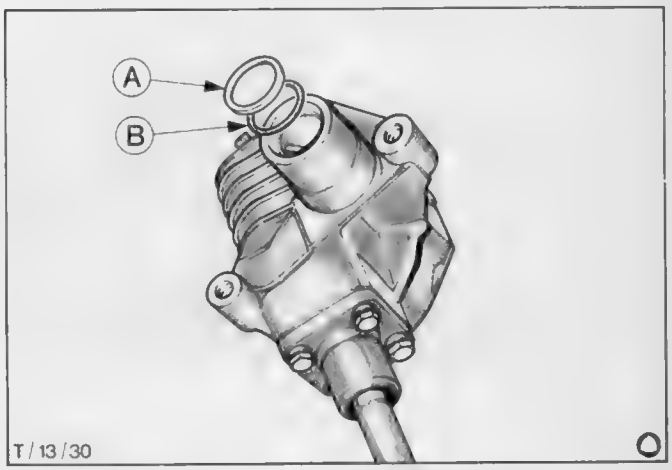

Fig.31. Rocker shaft 'O'ring and retainer.
A - Retainer
B - 'O'ring seal

15. Position worm nut onto steering shaft worm, feed twenty seven (27) steel balls into worm nut and transfer tube.

If difficulty is found in filling all the steel balls, fit transfer tube and carefully turn worm nut on shaft. Remove tube and repeat procedure until all steel ball have been fitted.

16. Clamp steering shaft and nut assembly by securing nut in a soft jawed vice. Fit the transfer tube clamp and bolts, bend over end of clamp to lock bolts.

17. Fit lower thrust bearing cup in steering box housing. Pass shaft and nut assembly through the side aperture positioning worm nut with transfer tube away from the aperture.

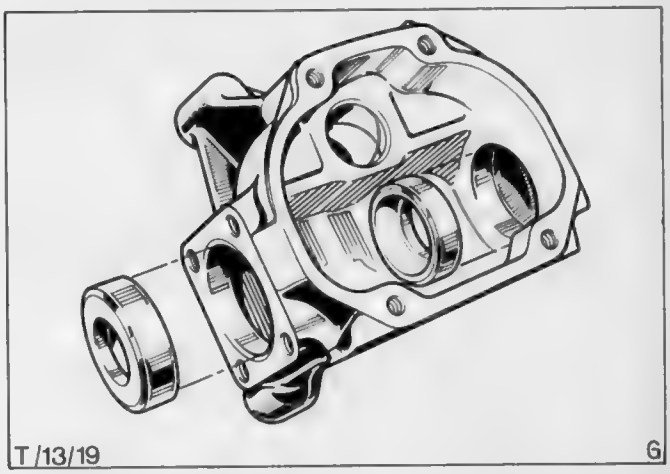

Fig.32. Assemble upper and lower bearing cups into steering housing.

18. Using a small quantity of suitable grease retain the steel balls in the upper and lower bearings. Carefully pass upper bearing over the steering shaft and locate in housing.

NOTE: There are 13 steel balls in the upper bearing and 10 steel ball in the lower bearing.

19. Fit shim pack and new gasket over steering shaft, secure upper bearing retainer to steering box. Tighten 21 to 25 Nm bolts to (2,1 to 2,5 Kgf.m - 15 to 18 lbf.ft) whilst turning the steering shaft.

NOTE: Turning torque should be achieved without the rocker shaft fitted.

NOTE: When all four securing bolts are torqued to correct specification the shim thickness should just eliminate shaft end float. Shims should be added or removed as necessary until a turning torque of 0,23 to 0,45 Nm (2 to 4 lfb,in) is achieved.

20. Remove bearing retainer bolts and apply sealer to mating faces and bolts, refit bearing retainer and tighten bolts to 21 to 25 Nm (2,1 to 2,5 kgf.m - 15 to 18 lbf.ft). Recheck turning torque of steering shaft.

21. Turn steering shaft so that worm nut is in central position, fit sliding pivot to worm nut, locate rocker shaft to housing to engage on worm nut.

22. Fit new side cover gasket, fit side cover and secure torque bolts to 21 to 25 Nm (2,1 to 2,5 kgf.m - 15 to 18 lbf.ft).

NOTE: Coat the two shorter bolts with suitable sealer to prevent oil seepage up the threads.

23. Coat rocker shaft adjusting screw with sealer and screw into side cover until the maximum overall gear turning torque is 1,0 to 1,5 Nm (9 to 13 lbf,in) when the steering gear is in the central position. Fit and tighten locknut to secure adjusting screw.

NOTE: When the steering gear is fitted to the vehicle the drag link must be disconnected befor checking steering gear turning torque, (pre-load).

24. Fill steering gear with 0,42 litre (0,74 pints) of SAE80 (specification SQM2C 9008 AA) steering gear oil, through filler hole, fit filler plug.

NOTE: When assembled the steering gear should turn smoothly without harshness from lock to lock. At no stage should the turning torque exceed the torque in the central position by more than 0,4 Nm (4 lbf,in).

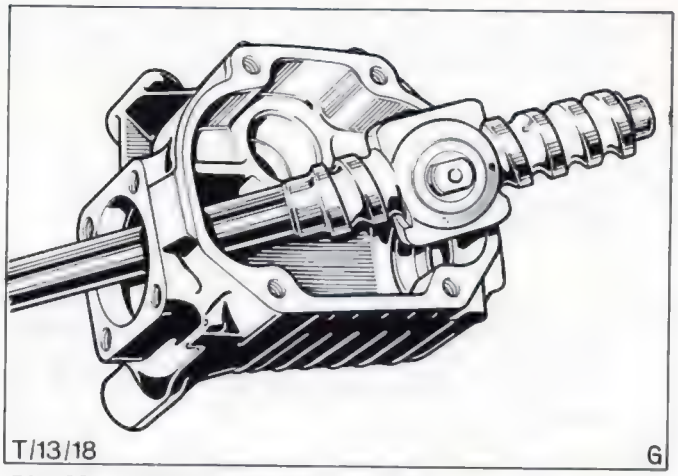

Fig.33. Assemble steering shaft and nut through steering box housing.

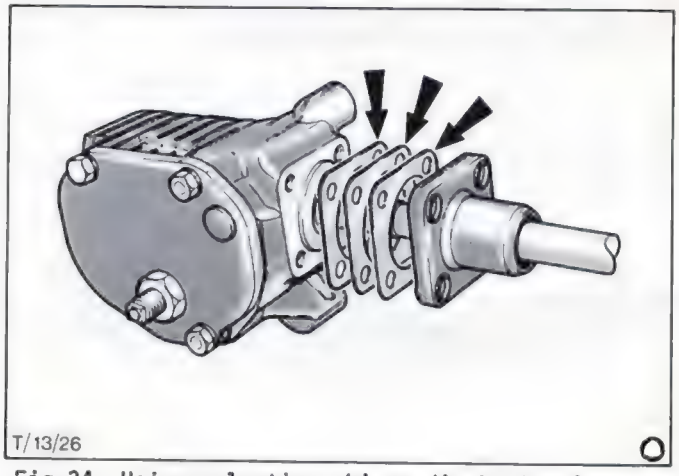

Fig.34. Using selective shims adjust steering gear per-load.

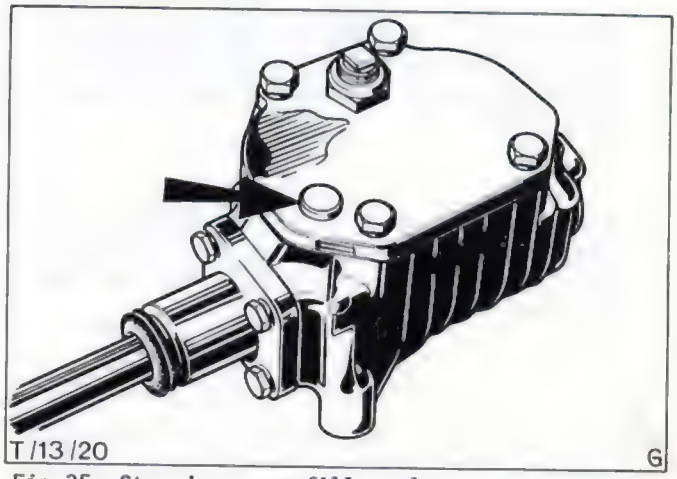

Fig.35. Steering gear filler plug.

13 222 DROP ARM - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator..	13 006
Puller	14 008

To Remove

1. Remove split pin, slacken castellated nut, using service tool 13 006 disconnect drag link from drop arm.

2. Slacken drop arm retaining nut, using service tool 14 008 puller remove drop arm from steering box Fig.36.

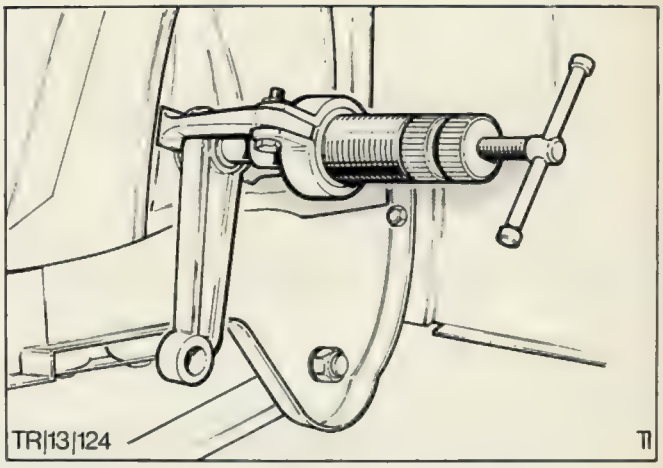

Fig.36. Remove drop arm using service tool 14 008.

To Install

3. Centralise steering, fit drop arm, tighten locknut to specified torque (see Technical Data).

4. Reconnect drag link to drop arm. Fit castellated nut torque to correct specification (see Technical Data), fit new split pin.

5. Centralise steering, adjust drag link if necessary ensure that steering gear is at centre of travel (i.e. high spot) and front wheels are in the straight ahead position.

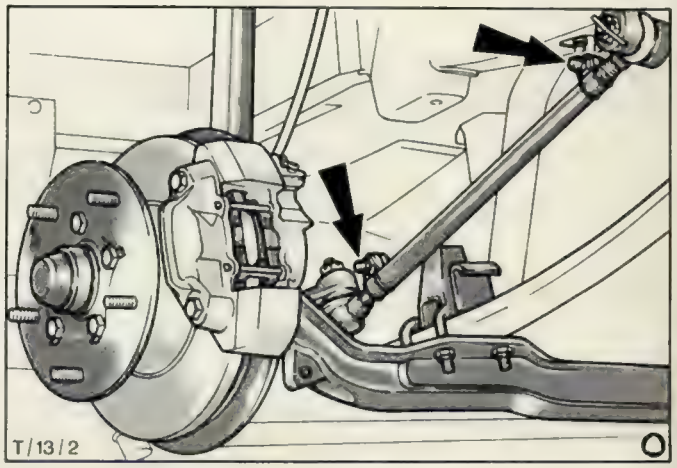

Fig.37. Drag link to drop arm securing nut. Ensure that drag link clamp bolts are upper most.

13 242 STEERING ARM - REMOVE AND INSTALL (drivers side)

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator	13 006

To Remove

1. Jack up front of vehicle and fit chassis stands.

2. Remove split pin and slacken castellated nut securing drag link to steering arm, using service tool 13 006 remove ball joint Fig.38.

3. Remove split pin and slacken castellated nut securing track rod ball joint to steering arm, using service tool 13 006 release taper.

4. Remove lock nuts and bolts securing steering arm to spindle carrier.

NOTE: Before refitting throughly clean off steering arm and spindle carrier.

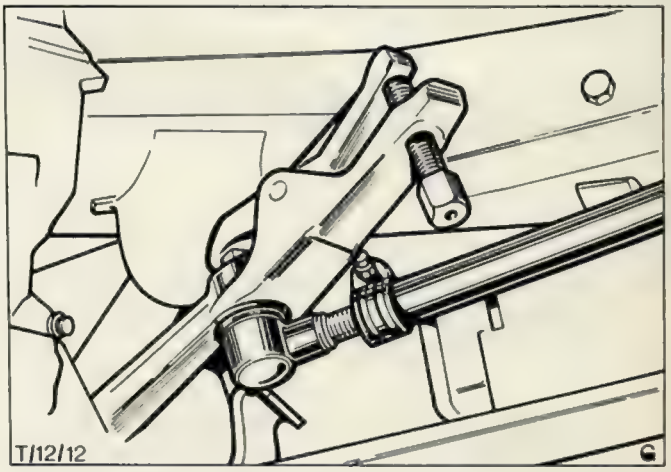

Fig.38. Remove drag link ball joint from steering arm.

13 242

To Install

5. Fit clean steering arm to spindle carrier and secure, tighten lock nuts to specified torque (see Technical Data) Fig.39.

6. Connect drag link to steering arm, tighten castellated nut to specification, fit split pin.

7. Reconnect track rod end to steering arm tighten castellated nut to specification, fit split pin.

8. Remove chassis stands and lower vehicle.

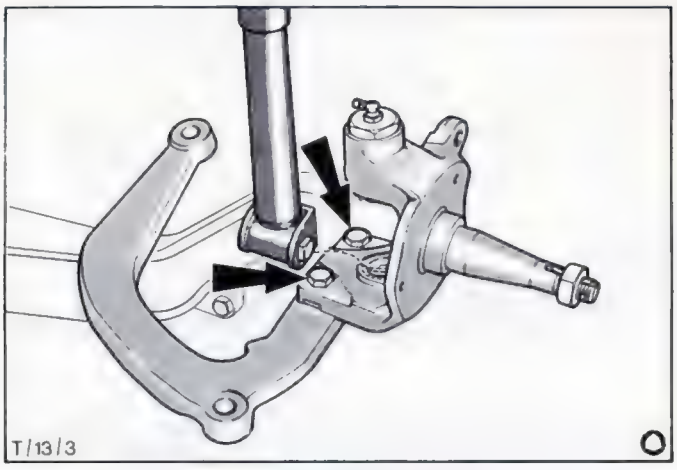

Fig.39. Steering arm fixing bolts (drivers side).

13 242 STEERING ARM - REMOVE AND INSTALL (non-drivers side)

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator 13 006

To Remove

1. Jack up front end and fit chassis stands.

2. Remove track rod end split pin, slacken castellated nut. Using service tool 13 006 disconnect track rod end from steering arm Fig.40.

3. Remove lock nuts and bolts securing steering arm to spindle carrier.

NOTE: Throughly clean off steering arm and spindle carrier fixture.

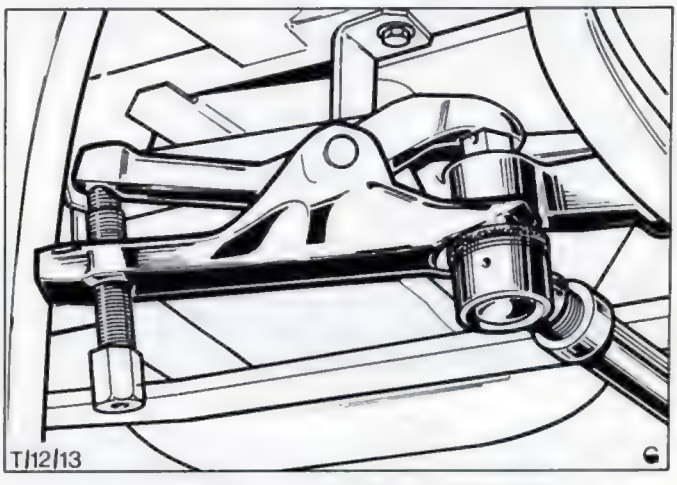

Fig.40. Remove track rod end from steering arm using service tool 13-006.

To Install

5. Fit clean steering arm secure with new locknuts, tighten to correct specification (see Technical Data). Fig.41.

6. Reconnect track rod to steering arm, tighten castellated nut and fit new split pin.

7. Remove chassis stands and lower vehicle.

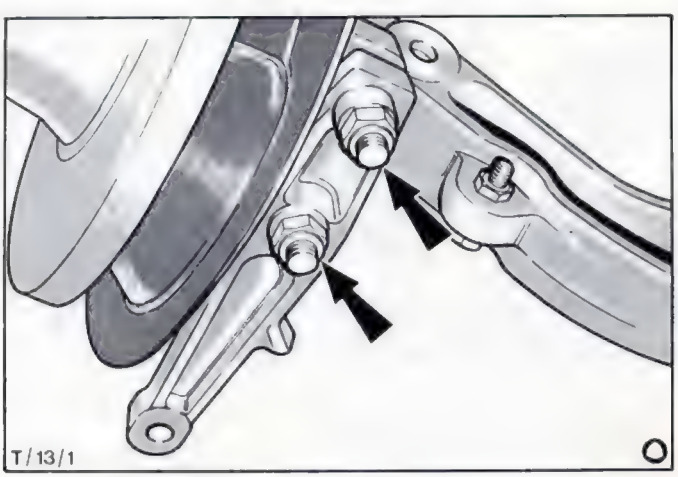

Fig.41. Steering arm fixing bolts. (non-drivers side)

13 252 DRAG LINK ASSEMBLY - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator 13 006

To Remove

1. Remove split pins and slacken castellated nuts securing drag link ends to steering arm and drop arm.

2. Using special service tool 13 006 release tapers, and remove drag link Fig.42.

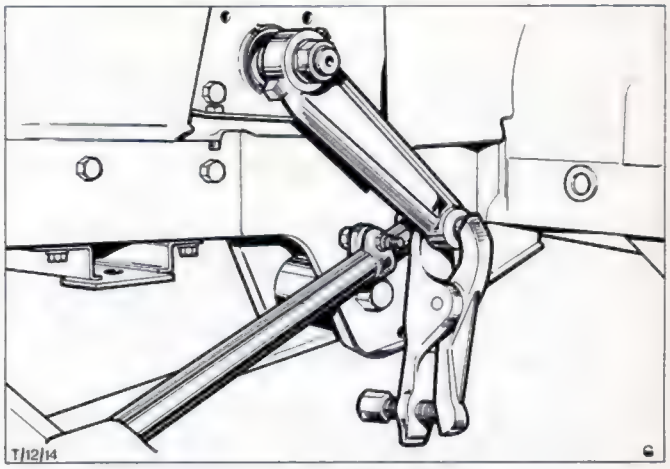

Fig.42. Detach drag link from drop arm using service tool 13 006.

To Install

3. Connect drag link to drop arm and steering arm, tighten castellated nuts to correct torque (see Technical Data).

4. Slacken off clamps, centralise steering, adjust drag link, if necessary. Ensure that steering gear is at its centre of travel position and front wheels in the straight ahead position.

NOTE: Drag link clamps should be positioned with clamp bolt above the drag link and bolt head towards centre of vehicle Fig.43.

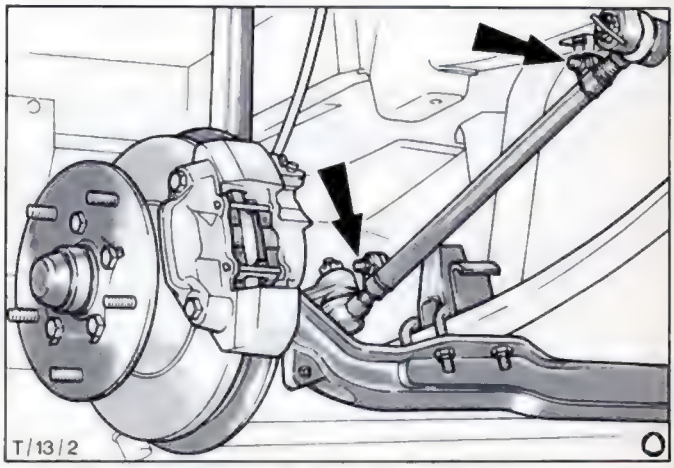

Fig.43. Assemble drag link clamp bolts uppermost with bolt heads towards centre of vehicle.

13 254 END - DRAG LINK - REPLACE

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator 13 006

To Remove

1. Jack up front of vehicle and fit chassis stands.

2. Set road wheels in straight ahead position.

3. Remove split pin, slacken castellated nut, using service tool 13 006 separate drag link ball joint and steering arm.

4. Slacken clamp bolt on drag link, unscrew drag link end ball joint.

NOTE: The drag link ends have left and right hand threads.

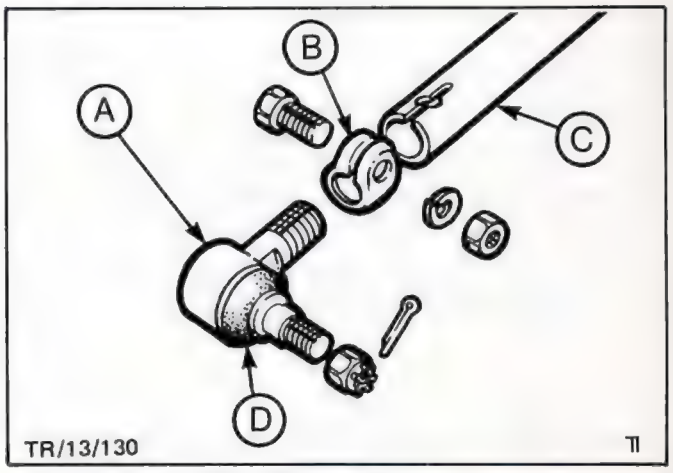

Fig.44. Drag link end assembly.
A - Drag link end C - Drag link
B - Clamp D - Rubber cap

13 254 (cont'd)

To Install

5. Refit drag link end ball joint, ensure that an equal number of threads are engaged into both drag ends.

6. Remove steering wheel emblem.

7. Determine steering gear mid-point of travel (total number of turns from lock to lock 5,5 for a 20:1 gear and 6,5 for 24:1 gear) the steering shaft alignment mark being at 12 o' clock. Centralise steering wheel to shaft. (see Operation 13 523) Fig.45.

8. Connect drag link to steering arm (without moving road wheels) tighten castellated nut to correct torque, fit new split pin.

NOTE: Steering wheel alignment may alter during the fitting of the drag link.

9. Adjust drag link length until steering shaft/wheel is correctly aligned in the 12 o' clock position.

10. Total length of ball joint centres will be approximately 45,5 cm (18 in). This length may be varied to accommodate tolerance build up in the steering mechanism.

11. Tighten clamp bolts, ensure clamp bolts are positioned above drag link and ball joints are at 90° to each other. See Fig.43.

12. Refit steering wheel centre emblem and lower vehicle

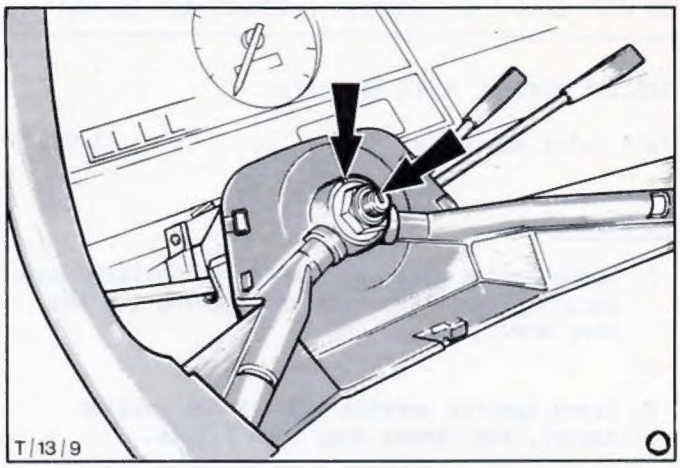

Fig.45. Centralise steering wheel shaft 12 o'clock position.

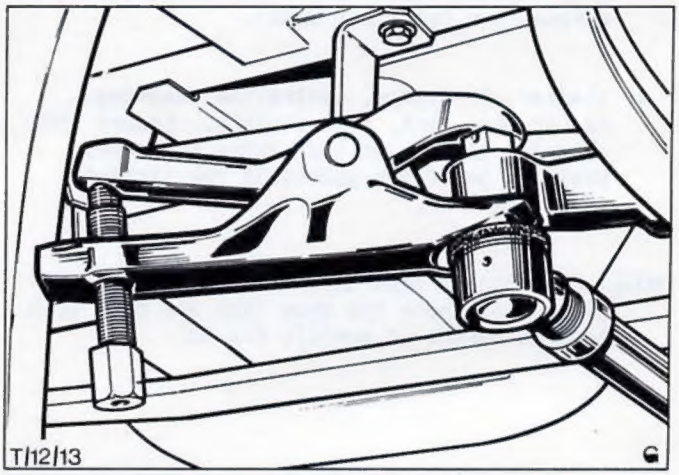

Fig.46. Detach track rod ball joints from steering arms using service tool 13 006.

13 262 TRACK ROD - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator 13 006

To Remove

1. Remove and discard split pins, slacken castellated nuts on track rod ends.

2. Using service tool 13 006 separate joints from steering arms remove track rod.

To Install

3. Locate track rod ball joints in steering arms tighten nuts to specification, fit new split pins.

4. Check and adjust toe-setting if necessary refer to Operation 14 113.

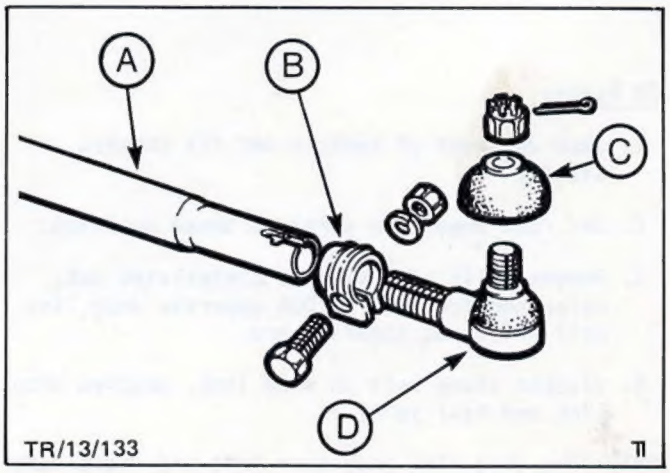

Fig.47. Track rod end assembly.
A - Track rod
B - Clamp
C - Rubber cap
D - Track rod end

13 273 END - TRACK ROD - REPLACE (one)

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator 13 006

To Remove

1. Remove split pin and slacken castellated nut.
2. Using ball joint separator Tool No. 13 006 separate ball joint from steering arm.
3. Slacken clamp bolt on track rod unscrew track rod end.

NOTE: Track rod ends have left and right hand threads.

To Install

4. Refit track rod end, ensure that same number of threads are engaged as original.
5. Refit track rod to steering arm, tighten castellated nut to correct specification. Fit new split pin.
6. Adjust toe setting. Refer to Operation 14 117.
7. Tighten track rod end clamp bolt.

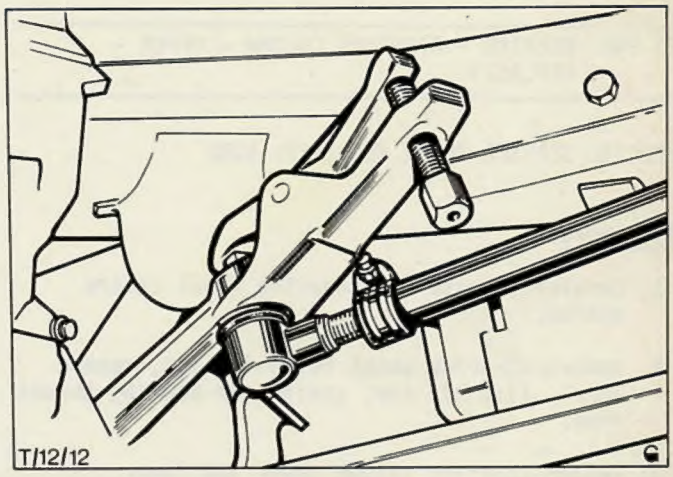

Fig.48. Disconnect ball joint using service tool 13 006.

13 523 STEERING WHEEL - CENTRALISE

SPECIAL SERVICE TOOLS REQUIRED: NONE

1. Set road wheels in straight ahead position.
2. Remove steering wheel centre emblem.
3. If alignment mark on steering shaft is within 30° of 12 o'clock position remove steering wheel retaining locknut and centralise steering wheel Fig.49.
4. Refit locknut and torque to 28 to 34 Nm and replace centre emblem.
5. Re-Alignment if more than 30° from 12 o'clock position.

- Slacken drag link clamp bolts and nuts, adjust drag link until alignment mark is in the 12 o'clock position.
- Rotate if necessary through the smallest angle until the clamp bolts are horizontally above the drag link Fig.50.
- Carry out procedures 1 to 4 as detailed above to finally align steering wheel.

NOTE: Each steering shaft spline is equal to 10° so when steering wheel is centralised, shaft alignment marks should be no more than three (3) splines from the 12 o'clock position.

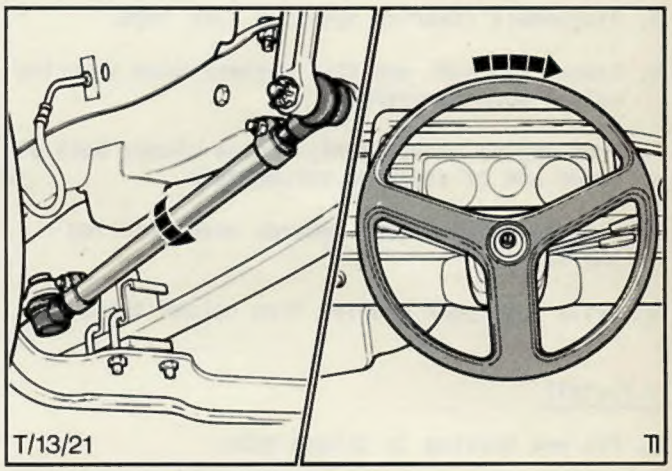

Fig.49. Steering wheel misaligned clockwise, rotate drag link anti-clockwise.

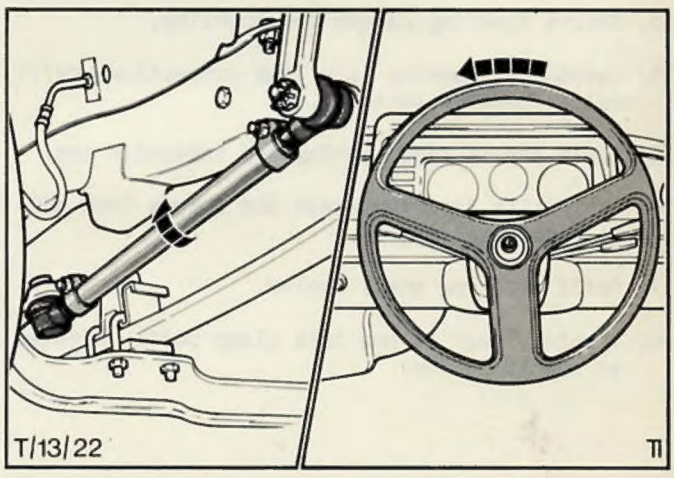

Fig.50. Steering wheel misaligned anti-clockwise, rotate drag link clockwise.

13 548 BEARING - STEERING COLUMN - UPPER - REPLACE)

SPECIAL SERVICE TOOLS REQUIRED: NONE

To Remove

1. Carefully prise off steering wheel centre emblem.
2. Remove steering wheel retaining nut, remove wheel, lift off cam, spring and bearing thrust ring.
3. Remove steering column upper and lower shrouds by removing retaining screws.
4. Detach multi function switches and bracket from column.
5. Disconnect steering ignition lock loom.
6. Remove two nuts and flat washers from steering column upper mounting.
7. From engine compartment, loosen clamps bolt at lower end of steering column tube.
8. Withdraw column tube upwards over steering shaft.
9. Prise out upper bearing from column tube.

To Install

10. Fit new bearing to column tube.
11. Position clamp on tube, slide steering column tube over shaft, through dash panel.
12. Carefully locate steering column tube over 'O' ring on steering gear.
13. Secure steering column top mounting.
14. Reconnect steering lock loom connection, refit multi function switches.
15. Refit thrust ring, spring and indicator cam.
16. Centralise steering wheel and secure lock nut to specification.
17. Refit steering wheel emblem.
18. Tighten lower column tube clamp bolt. Tighten to specification.

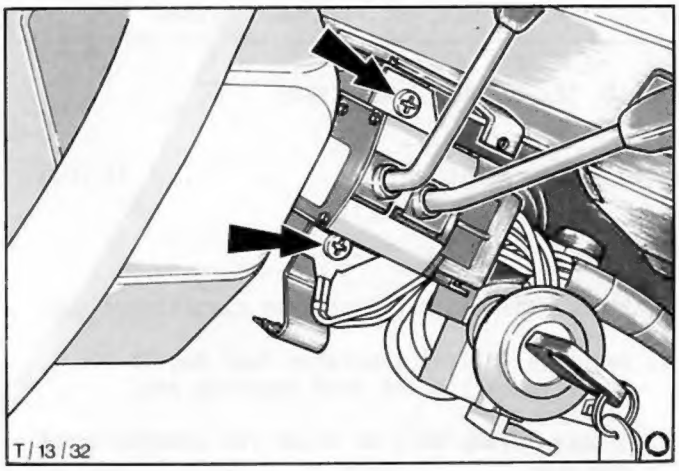

Fig.51. Remove two screws securing multi-function switches.

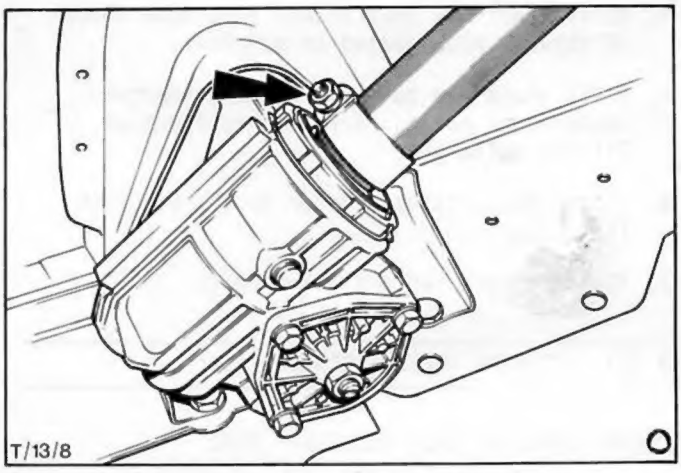

Fig.52. Column tube lower clamp bolt and upper fixings.

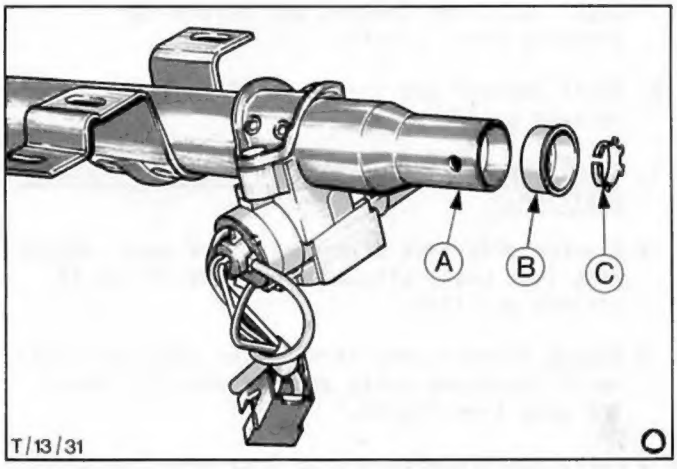

Fig.53. Assemble bearing to column tube.
A - Steering column tube
B - Bearing
C - Thrust ring

TECHNICAL DATA

Type	Worm and Nut
Total pre-load (worm shaft) Standard	1,6 to 2,2 Nm for low ratio gear (6 turns) 2,5 to 3,0 Nm for high ratio gear (7 turns)
Lubrication	Grease SLM 1C 9110-A Oil SQM 2C 9008-A
Capacity - Standard	Grease 2,2 Kg.
Capacity - heavy duty	Oil 0,42 Litre.
Ratio - standard	20:1 (6 turns) 24:1 (7 turns)
Ratio - heavy duty	Variable

Tightening Torques (standard gear)	Nm	Kgfm	lbf.ft
Drop arm lock nut	155 to 185	15,5 to 18,5	114 to 136
Rocker arm side cover	18,6 to 22,6	1,9 to 2,3	14 to 17
Rocker arm adjusting locknut	29,4 to 39,2	2,9 to 3,9	21 to 28
Steering worm shaft adjuster locknut	118 to 147	11,8 to 14,7	87 to 108
Steering column tube lower clamp	20 to 25	2,0 to 2,5	15 to 18
Steering wheel locknut	28 to 34	2,8 to 3,4	21 to 25
Drag and Track rod end castellated nuts	70 to 90	7,0 to 9,0	51 to 66
Steering box to body	54 to 64	5,4 to 6,4	40 to 47
Steering column tube upper column	13 to 16	1,3 to 1,6	9 to 11
Steering arm to spindle	55 to 63	5,5 to 6,3	40 to 46
Drag link and track rod clamp nuts	18 to 21	1,8 to 2,1	13 to 15
Rocker shaft side cover (heavy duty)	21 to 25	2,1 to 2,5	15 to 18
Steering shaft cover plate (heavy duty)	21 to 25	2,1 to 2,5	15 to 18